VOLUTE INLET OF FAN

FIELD OF THE INVENTION

The present invention relates to cooling devices and more particularly to a volute inlet of a fan with an improved heat dissipation characteristic.

DESCRIPTION OF RELATED ART

The improvements of computer components are continuous. Also, heat generated by running computer components is increased. This is particularly true for a CPU (central processing unit) and data storage components (e.g., hard disk). It is understood that the normal operation of a computer will be adversely affected or even the computer will be broken down if accumulated heat is not dissipated sufficiently. As such, well heat dissipation is critical for the computers.A heat dissipation device for a computer is either a liquid cooled or an air cooled type. Also, a fan is the most important element of the heat dissipation device of either type. This is particularly true for the notebook computer or the 1U server. However, the increase of the number of fans is limited or even impossible due to the narrow internal space of the computer or the 1U server. Hence, the only way to

increase the heat dissipation capability of a computer is to increase the efficiency of the fan.

A prior eccentric fan disclosed an inlet and blades at positions other than center thereof. It is known that introduced air will cause turbulence due to collision with three sidewalls (other than inlet) of the housing of fan. This will decrease the speed of the set-up air current and thus will decrease efficiency. As such, the above eccentric configuration aims at decreasing the turbulence and thus increases the efficiency of the fan.

However, the prior eccentric design requires a larger space for accommodating components of the fan. This contradicts the trend of downsizing of modern electrical and/or electronic products. The space between the blades of the fan and the three sidewalls of the housing is from the maximum to the minimum, but an area of the inlet is equal to an area of the blades. Moreover, turbulence still cannot be completely eliminated due to the collision of the set up current of the air with sidewalls of the housing. As a result, the purpose of increasing the heat dissipation capability of a fan is not achieved. Thus, the need for improvement still exists.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a fan for cooling an electronic device without modifying a housing of the fan. Instead, the fan is designed to have a volute inlet rather than a circular one to partially cover blades by adapting to the direction of the introduced air. The inlet has a reference point on the housing with respect to an outlet. The blades are partially covered by the inlet from the reference point wherein an area of the blades covered by the inlet is from a maximum to a minimum gradually in a closed loop. As a result, the set-up air current can reach a maximum prior to output from the outlet, thereby increasing the heat dissipation capability of the fan.The above and other objects, features and advantages of the present invention will become apparent from the following detailed description taken with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will become more fully understood from the detailed description given hereinbelow and the accompanying drawings which are given by way of illustration only, and thus are not limitative of the present invention, and wherein:

FIG. 1 is a perspective view of a first preferred embodiment of a fan incorporating a volute inlet according to the invention;

FIG. 2 is an exploded view of FIG. 1;

FIG. 3 is a top plan view of FIG. 1;

FIG. 4 is a perspective view of a second preferred embodiment of a fan incorporating a volute inlet according to the invention;

FIG. 5 is an exploded view of FIG. 4;

FIG. 6 is a top plan view of FIG. 4; and

FIG. 7 is a top plan view similar to FIG. 3 but showing a concentric outlet.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGS. 1 and 2, a first preferred embodiment of fan 10 is shown in accordance with the invention. The fan 10 has an improved inlet 13 for increasing heat dissipation capability thereof as detailed below. The inlet has a shape started from a reference point 131 with respect to an outlet 14. Blades 12 are partially covered by the inlet 13 from the reference point 131 in which the covered area of blades is from a maximum to a minimum gradually in a closed loop. This forms a volute inlet rather than a circular inlet 13.

The fan 10 is implemented as a centrifugal fan and comprises a housing 11, a plurality of blades 12 rotatably supported by a shaft, an inlet 13 on two sides of the

hosuing 11, and a side outlet 14. The inlet 13 is either concentric, as shown in FIG. 7, or eccentric, as shown in FIG. 3, with respect to the housing 11. Also, the shaft of the blades 12 is located at a center of the inlet 13.

Referring to FIG. 3, the inlet 13 is substantially divided into four quarters. The first quarter begins at the reference point 131 in which an area of the blades 12 covered by the first quarter of the inlet 13 is a maximum as indicated by dashed lines. As such, the amount of introduced air per unit time will be decreased and thus the air compression ratio will be increased. Consequently, in the second quarter the amount of introduced air per unit time will be increased slightly as the area of the blades 12 covered by the second quarter is decreased. As such, the air current will be further compressed. In the third quarter, more air is introduced into the housing 11 and thus the air current will be still further compressed. In the fourth quarter, the covered area of the blades 12 is a minimum and the set-up air current reaches a maximum prior to output from the outlet 14. As a result, a component facing the outlet 14 will be sufficiently cooled.

Note that a reverse air current will be generated if the component is very close to the outlet 14. Also, a reverse air current will be also generated if the suction effect in the third quarter is large enough due to the quick expansion of low pressure air. Advantageously, the invention can overcome the above adverse factors. Moreover, the

volute shape of the inlet 13 can increase the set-up air current by increasing a pressure difference between the inlet 13 and the outlet 14. Thus, more driving power is transmitted to the shaft. This in turn will increase the efficiency of the fan 10 by increasing the heat dissipation capability thereof. In addition, noise generated during operation can be significantly reduced.

Referring to FIGS. 4 to 6, a second preferred embodiment of fan 10' is shown in accordance with the invention. The second preferred embodiment substantially has same structure as the first preferred embodiment. The only difference between the first and the second preferred embodiments is that the housing 11' has a shape different from the housing 11. The second preferred embodiment aims at accommodating the fan of the invention to different interior space of an electronic device.

While the invention herein disclosed has been described by means of specific embodiments, numerous modifications and variations could be made thereto by those skilled in the art without departing from the scope and spirit of the invention set forth in the claims.